UPDATE OF STOCK STATUS INDICATORS FOR NORTHERN SHRIMP IN THE ESTUARY AND GULF OF ST. LAWRENCE

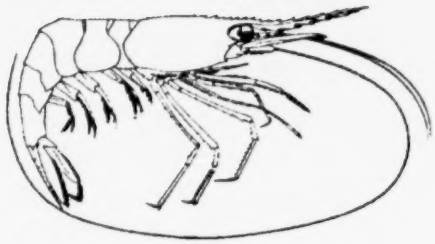

Figure 1. Shrimp fishing areas in the Estuary and Gulf of St. Lawrence.

Context

The Northern Shrimp (*Pandalus borealis*) fishery in the Gulf of St. Lawrence is conducted by trawlers in four shrimp fishing areas (SFA): Estuary (SFA 12), Sept-Îles (SFA 10), Anticosti (SFA 9) and Esquiman (SFA 8) (Figure 1). Shrimp fishing is regulated by a number of management measures, including the setting of total allowable catches (TAC). TAC-based management limits fishing to protect the reproductive potential of the population. The essential elements for the establishment of a precautionary approach were adopted in 2012. Reference points were determined and guidelines were established to determine harvest based on the main stock status indicator and its position in relation to the stock status classification zones (healthy, cautious and critical). The harvest guideliunes are based on a constant exploitation rate when the stock is in the healthy zone. The harvest rate decreases in the cautious zone as far as to the critical zone, where the exploitation rate is stable at a value that is four times lower than that of the healthy zone. Once the harvest is established, decision rules are applied to determine the TAC.

The 2012 TACs were set based on these decision rules. This update presents the information necessary for the determination of the 2013 TACs. Estimates of the main stock status indicator are produced based on 2012 data and a harvest for 2013 is determined from the application of the guidelines. This Science Response is a result of the special Science Response process that was conducted at the Maurice Lamontagne Institute on January 18, 2013.

Analysis

Description of the Fishery

Landings of Northern Shrimp in the Estuary and Gulf of St. Lawrence totalled over 36,300 tons in 2010 and 34,200 tons in 2011 (Figure 2). In 2012, the TAC was reduced by 15% in Sept-Îles and Anticosti and increased by 15% in Estuary and Esquiman. Preliminary statistics indicate that the landings for all areas were close to 32,000 tons in 2012. The landing reached 97% of the TAC in all areas except in Estuary where it represents 91% of the TAC.

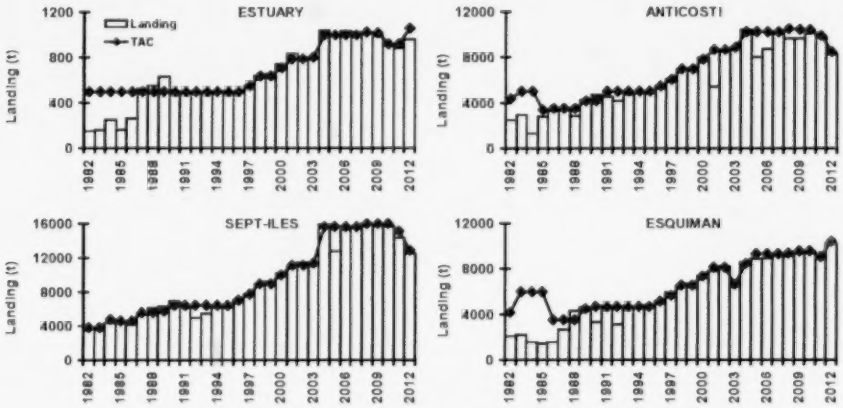

Figure 2. Landing and total allowable catch (TAC) by fishing area and by year. The 2012 landing data are preliminary

Catch rate and biomass

The distribution of catch rates from the commercial fishery and biomass from the research survey shows that high concentrations of shrimp were found in all fishing areas in 2012 (Figure 3). However, the southern sector of Anticosti and Esquiman areas sustained very few shrimp. The 2012 catch rate was similar to that of 2011 in all areas except in Anticosti where it was lower. In 2012, biomass increased by 48% relatively to 2011 in Sept-Îles area, in particular because of the increase in the male component. The biomass in Esquiman area decreased by 34% between 2011 and 2012 while that of Estuary and Anticosti increased by 17 and 13% respectively.

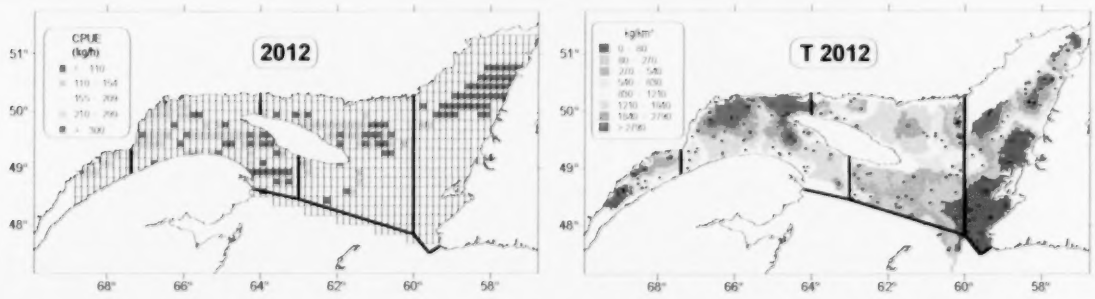

Figure 3. Distribution of catch rates from the commercial fishery (left panel) and biomass from the research survey (right panel) in 2012.

Exploitation rate index

The indices of exploitation rate resulting from the 2012 fishery were similar to the mean for the years 1990-2010 in all areas except in Anticosti where it was higher than the mean but lower than in 2011 (Figure 4).

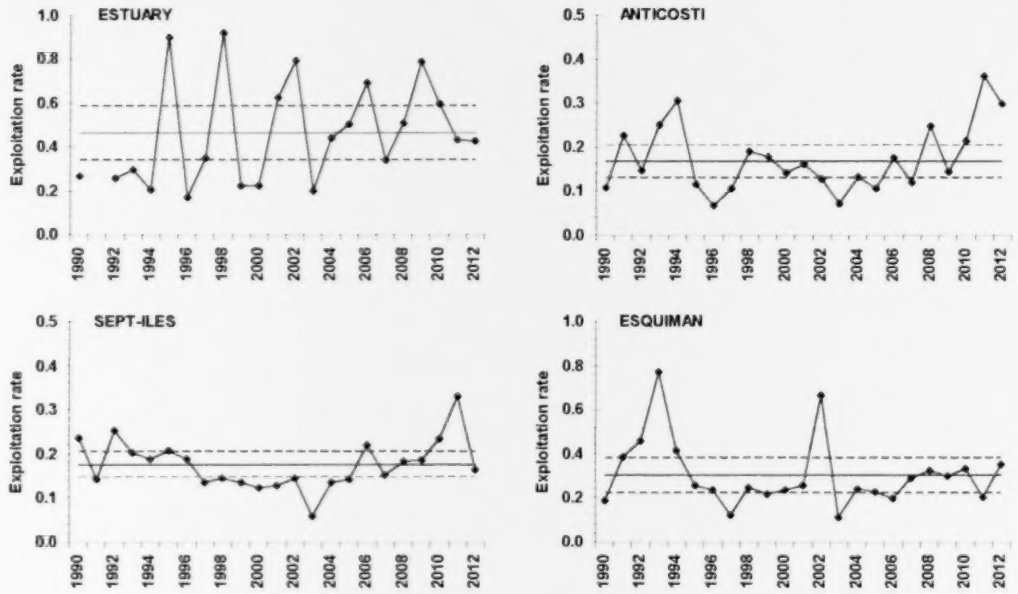

Figure 4. Index of the exploitation rate by fishing area and by year. The solid horizontal line represents the 1990–2010 mean ± 0.5 standard deviation.

Main Stock Status Indicator

The main indicator of stock status is calculated from the male and female indices obtained from the summer fishery (number per unit effort for June, July and August) and the research survey (abundance). The main indicator corresponds to the average of the indices by sex that were standardized with respect to the 1990–1999 period.

The four Northern Shrimp stocks in the Estuary and the Gulf of St. Lawrence have remained in the healthy zone since the early 2000s (Figure 5). The stock status indicators show an interannual variability that is stationary since they have been in the healthy zone. The main stock status indicator for Estuary area increased in 2012 for the third consecutive year to reach the highest value of the series. The decreasing trend observed in Sept-Îles area since 2007 has stopped in 2012 with the increase in the main indicator which reached a value similar to those observed in 2008, 2009 and 2010. In 2012, the main indicator for Anticosti area was slightly lower than in 2011. The Esquiman area indicator decreased in 2012 to reach a value similar to those observed between 2006 and 2009.

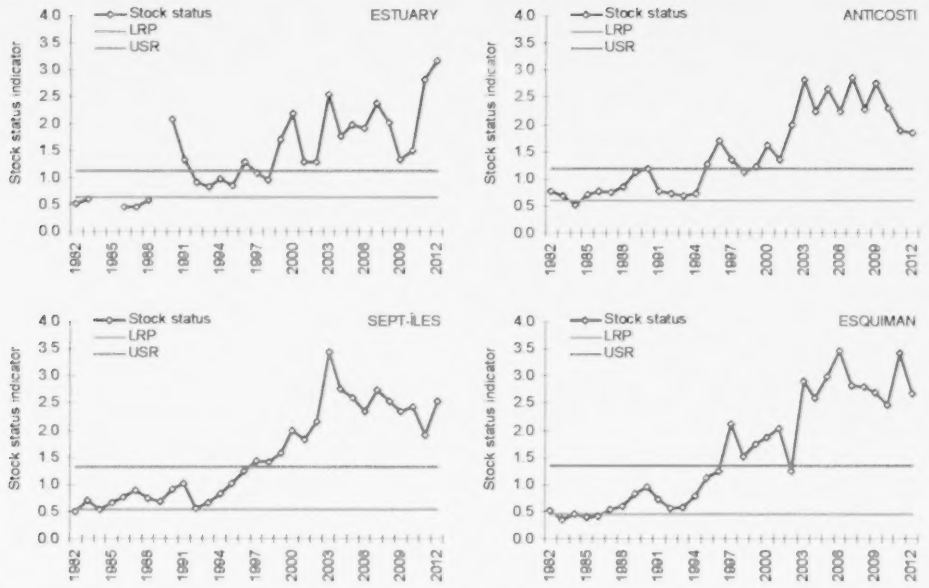

Figure 5. Main stock status indicator by fishing area and year, and limit (LRP) and upper (USR) stock reference points for each fishing area

Harvest for 2013

The guideline to determine the 2013 harvest is based on a constant exploitation rate because the stocks are in the healthy zone (Figure 6).

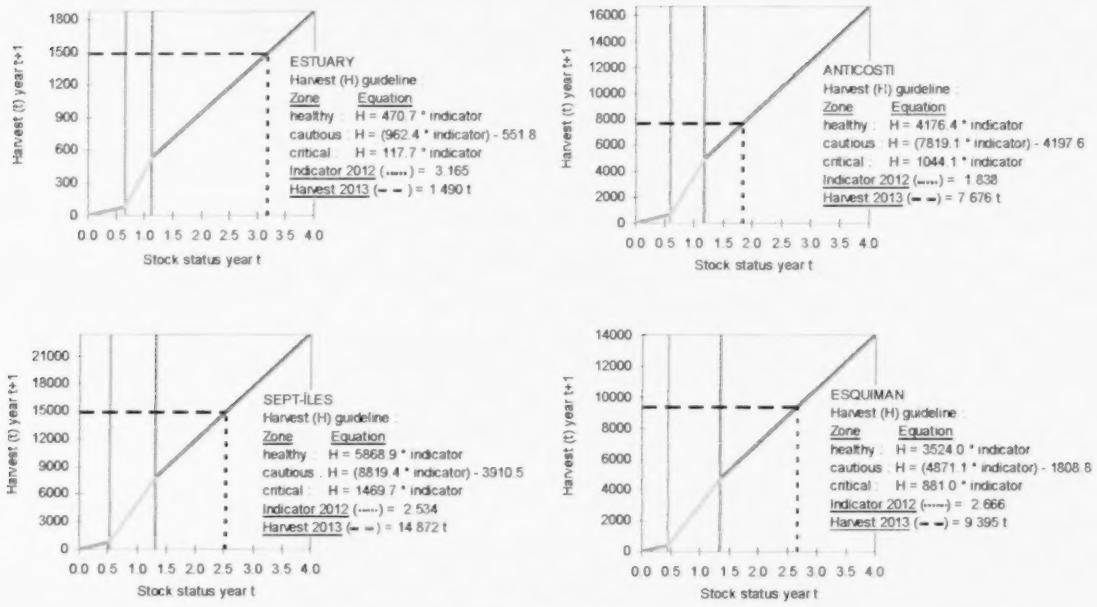
ESTUARY
Harvest (H) guideline :
Zone Equation
healthy : H = 470.7 * indicator
cautious : H = (962.4 * indicator) - 551.8
critical : H = 117.7 * indicator
Indicator 2012 (·····) = 3.165
Harvest 2013 (– –) = 1 490 t
ANTICOSTI
Harvest (H) guideline :
Zone Equation
healthy : H = 4176.4 * indicator
cautious : H = (7819.1 * indicator) - 4197.6
critical : H = 1044.1 * indicator
Indicator 2012 (·····) = 1.838
Harvest 2013 (– –) = 7 676 t
SEPT-ÎLES
Harvest (H) guideline :
Zone Equation
healthy : H = 5868.9 * indicator
cautious : H = (8819.4 * indicator) - 3910.5
critical : H = 1469.7 * indicator
Indicator 2012 (·····) = 2.534
Harvest 2013 (– –) = 14 872 t
ESQUIMAN
Harvest (H) guideline :
Zone Equation
healthy : H = 3524.0 * indicator
cautious : H = (4871.1 * indicator) - 1808.8
critical : H = 881.0 * indicator
Indicator 2012 (·····) = 2.666
Harvest 2013 (– –) = 9 395 t
Harvest (t) year t+1
Stock status year t

Figure 6. Harvest guidelines by fishing area, main indicator of stock status in 2012 and projected harvest for 2013.

Conclusions

The main stock status indicator shows that the four stocks were in the healthy zone in 2012. The harvests projected for 2013 are the following:

Fishing area	Estuary	Sept-Îles	Anticosti	Esquiman
Harvest projected for 2013	1 490 t	14 872 t	7 676 t	9 395 t

The 2013 TACs will be determined from these harvests according to the decision rules adopted in 2012.

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Sources of Information

This Science Response Report results from the Science Special Response Process of January 18, 2013 on the Updated indicators status of the northern shrimp stocks in the Estuary and Gulf of St. Lawrence. Additional publications from this process will be posted as they become available on the Fisheries and Oceans Canada Science Advisory Schedule.

DFO 2012. Assessment of Shrimp Stocks in the Estuary and Gulf of St. Lawrence in 2011. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/006.

Savard, L. 2012. Stock status indicators and reference points consistent with a precautionary approach for northern shrimp in the Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/006. ii + 29 p.

Savard, L. 2013. Update of the northern shrimp commercial fishery indices in the Estuary and the northern Gulf of St. Lawrence in 2012. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/003. ii + 51 p.

Savard, L. and Bourdages H. 2013. Update of the estimation of northern shrimp *Pandalus borealis* biomass and abundance from the trawl survey in the Estuary and the northern Gulf of St. Lawrence in 2012. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/002. ii + 33 p.

This report is available from the:

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MPO. 2013. Mise à jour des indicateurs de l'état des stocks de crevette nordique de l'estuaire et du golfe du Saint-Laurent. Secr. can. de consult. sci. du MPO. Rép. des Sci. 2013/001.